

CHEMICAL & ENGINEERING NEWS

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C&EN

APRIL 4, 1994

MORE SCIENTIFIC NEWS FROM THE ACS NATIONAL MEETING IN SAN DIEGO PAGE 25

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PERSONAL CARE PRODUCTS

Recessionary pressures,
consumer trends drive
chemical raw materials
growth Page 38

CHEMICAL & ENGINEERING NEWS C&EN

APRIL 4, 1994

NEWS OF THE WEEK

■ Artificial protein that binds four heme groups in a well-defined conformation is designed and synthesized for the first time, should facilitate study of how complex respiratory and photosynthetic systems work. **Page 4**

■ FDA is considering regulating nicotine content of cigarettes and is collecting evidence on whether cigarette makers are manipulating levels of the addictive substance in their products. **Page 5**

■ Ceremony designates Chandler Laboratory at Lehigh University as the second National Historical Chemical Landmark. **Page 6**

■ Adopted despite U.S. objections, an international agreement, effective immediately, bans all exports of hazardous wastes from industrialized nations to developing countries. **Page 6**

■ First R&D foundation established by the Chinese government and a foreign company—Ford Motor Co.—selects the first 25 projects that it will fund at 16 Chinese institutions. **Page 7**

■ Shanghai Chlor-Alkali Chemical, a Chinese firm, has begun offering shares of its stock for sale in the U.S. **Page 7**

COVER: Witco researcher conducts hair swatch evaluation at company's research and technical lab in Dublin, Ohio

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BUSINESS

Biotechnology industry made modest strides last year despite widely fluctuating stock prices caused by investor uneasiness and products that didn't pan out in the marketplace. **Page 15**

Business Insights: Chemical productivity rose in 1993, but not as much as expected considering the reorganizations, work force reductions, and other cost-cutting steps taken by the industry. **Page 18**

GOVERNMENT

Education, environmental issues are being discussed and debated in Congress. ■ NIH is collecting feedback on its first test of a triage system to reduce the burden of reviewing grant applications. ■ Competitiveness outlook for environmental technology is explored in a government report. **Page 20**

SCIENCE/TECHNOLOGY

From the ACS meeting in San Diego: Developments in membrane technology are providing a better understanding of how membranes work. ■ Finding chromophores suitable for electro-optic polymers is the goal of several research groups. ■ Scientists take issue with the public perceptions of risk at a symposium on food safety evaluation. ■ Microalgae are a potential source of lipids that could be converted into a diesel fuel substitute. ■ Efforts to develop acetylene-based resins for thermoset composites, coatings, and fibers are making headway. **Page 25**

Proposals for research on drinking water are being solicited by a foundation that has \$4.7 million for new projects in 1994. **Page 30**

EDUCATION

From the ACS meeting in San Diego: Chemical educators weigh merits of adding environmental theme to college chemistry courses. ■ Chicago-area high school teachers group uses imaginative demonstrations to attract students to science. **Page 34**

ACS NEWS

ACS Council and Board met in San Diego to deal with dues, presidential slate, and subscription prices. **Page 50**

PRODUCT REPORT



The mature personal care products market is prompting many companies to turn to their suppliers for more creative and better performing ingredients, help in new product development. **Page 38**

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LETTERS

Certification is not the answer

Larry Fink hits the nail on the head with his first paragraph (C&EN, Feb. 28, page 2). Yes, there are real opportunities for clever chemists who can devise better ways to do chemistry. Unfortunately, he writes seven more paragraphs that have nothing to do with clever chemistry. He proposes legislation that would add more red tape for government and industry, further diminishing the efficiency of both. He would require a "certified" professional chemist and professional engineer in order to manufacture, formulate, store, use, recycle, or dispose of any chemical.

"Political clout" is not the road to job security. The autoworkers unions once had tremendous political clout, but the marketplace bypassed them and exported a huge segment of the auto industry to other countries. Unless such rules can be imposed on the entire planet, they would simply put U.S. chemists and their employers at a competitive disadvantage. Go back to that first paragraph of Fink's letter, and do creative things with chemistry—creating something of value will bring you much closer to economic security.

D. Eric Walters
Vernon Hills, Ill.

Environmental policy

Opinions recently expressed on environmentalism by readers (C&EN, Feb. 21, page 2) confirm my hypothesis that highly educated people are not necessarily good policymakers. Any good policy should manage risk to an acceptable level based on a cost-benefit analysis. The crux of the issue is whether or not current environmental policy is managing low-risk activity at high cost.

One reader asserted that all "species ... living in the world [work together] ... to jointly create a benign environment wherein all species escape the threat of extinction." Tell that to the dinosaurs! Charles Darwin had a distinctly different view of nature—more along the "dog-eat-dog" theme. It is ironic that James Burke ["The Day the Universe Changed," BBC TV] asserts it was the very fact that species were found to have gone extinct naturally—which conflicted with then-dominant Western religious beliefs—that in-

spired the environmental studies leading up to Darwin's theories on evolution and modern environmentalism. The reader seems to claim that human activity currently is somehow exempt from Darwinian forces. Basing policy on the flawed environmental "religion" that human activities are beneath (or above) and not part of nature may result in a reprise of the Dark Ages, a period when thought itself was based on constructs that did not survive the light of logic.

Not all natural wastes "degrade." Crude oil certainly is toxic to the environment. The important point is the time frame over which a waste degrades versus how fast it accumulates adverse affects. The purpose of environmental expenditures ought to be to reduce the production rate or increase the degradation rate (natural or otherwise) of wastes in relation to their risk production rate; that is, to strike a balance. Higher consequence scenarios should justify high expenditures. Accordingly, incineration of hazardous wastes (a high-cost activity for a high-risk/low-probability combination) and sanitary treatment works (a high cost for a low-risk/high-probability combination) make sense; whereas, elimination of fluorocarbons (a high cost for an unknown risk with an unknown probability) may not make sense.

I fear the day when highly technical "experts" are allowed to keep the rest of us in politically correct Dark Ages.

Craig M. Oppat
Fort Washington, Pa.

Space station's purpose

There seems to be a misunderstanding regarding the space station. It is not a science project, it is an engineering project. Although some useful science will undoubtedly be done, that's not the primary purpose of the space station. Its primary purpose is to start developing the technology to settle space. Why is that important? There are several reasons, but the main one is this: Space is where humanity is headed next. A review of and extrapolation from human history and prehistory indicates that, so we might as well pave the way. That's the role of the space station, and its merit should be judged on the basis of how effectively it addresses that need.

Robert Legrand
Austin, Tex.

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Biotech Industry Makes Progress Despite Difficult Year in 1993

■ Pressures on stocks, health care reform, and product setbacks added to challenges facing the industry last year

Ann M. Thayer,
C&EN Northeast News Bureau

For the biotechnology industry, last year's worries were epic in more ways than one. The most public exposure of the technology, unfortunately for the industry, was in movie theaters with the film "Jurassic Park." Even worse, while biotechnology was depicted in a bad light on the big screen, health care reform was the real life *Tyrannosaurus rex* running rampant over the industry's parkland.

Fearful of the health care reform behemoth, investors at times were scared away from buying biotech stocks. Stock prices neared all-time highs and plummeted to all-time lows. And, while a few new products made their debut on the market, others long considered

very promising faced significant setbacks. Despite the downturns, however, the year had an upbeat ending with hopes that things would get better in 1994. Now early into the year, it is not clear that they will.

In many ways, 1993 differed little from 1992 (C&EN, March 29, 1993, page 17). Again revenues and product sales grew for many companies, but only a handful of the same companies reported profits for the year. And, in the performance of biopharmaceutical stock values, the year was a near repeat of 1992, moving quickly from early highs to dramatic lows, followed by a gradual comeback throughout the remainder of the year.

The C&EN stock price index for biopharmaceutical companies started 1993 within a few points of what would be the yearly high of 237 (close 1990 = 100). This mid-January 1993 peak, part of a positive trend seen in late 1992, was the nearest the index would come to the all-time high of 264 reached a year earlier. Throughout 1993, the agricultural biotechnology stock index continued to fluctuate widely around an average of about 230, while the Dow

Jones industrial average rose slowly, but steadily.

The early 1993 peak was short-lived, largely because of two events that managed to shake the whole industry, which was already unsteady by concerns about health care reform: In late February, Synergen disclosed that its leading drug candidate, Antril, did not perform well in clinical trials, and Amgen reported that first-quarter earnings would be 10 to 15% lower than expected (but still about 20% higher than a year earlier). Synergen's product was the third antiseptic product to disappoint—Xoma's E5 failed to impress the Food & Drug Administration in 1992, and Centocor's Centoxin was pulled from the European market and from U.S. clinical trials in January.

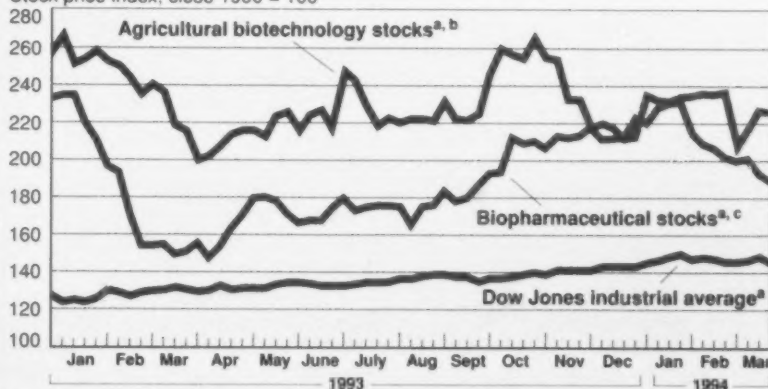
The C&EN biopharmaceutical stock index dropped 35%, hitting 154 in late February and remaining there for about two months. In late April, stock prices started to rise again and the index hovered around 175 until autumn. It then rose again, driven largely by marketing approvals for two new products, to end the year back in the low 220s.

Now the question is whether the cycle will occur a third time—in 1994. The biopharmaceutical stock index again reached a 12-month peak of 232 in late January. But stock values have been falling, down 19% by late March, and fell most recently on the news that Regeneron's leading product, for amyotrophic lateral sclerosis, had poor clinical trial results.

With investors losing confidence and becoming more reluctant to invest in risky stocks, companies have become discouraged about their ability to find capital to fund R&D (C&EN, Feb. 7, page 7). However, at several major companies where product sales contribute significantly to revenues, R&D spending increased in 1993. And overall, companies still did well in raising money sporadically through public and private financings in 1993.

Biotechnology stock prices fluctuated widely in 1993

Stock price index, close 1990 = 100



a Reindexed to show relative change. Prices as of Friday close each week. b Based on stock prices for Calgene, Crop Genetics, DNA Plant Technology, Ecogen, and Mycogen. c Based on stock prices for Amgen, Applied Bioscience, Biogen, Centocor, Chiron, Cytogen, Genentech, Genetics Institute, Immunex, Repligen, and Xoma.

Few biotechnology companies were profitable in 1993

\$ Millions	1993		Change from 1992		Profit margin ^b	
	Revenues ^a	Earnings	Revenues	Earnings	1993	1992
BIOPHARMACEUTICAL						
Affymax	\$ 15.2	\$ -20.3	19%	nm	def	def
Agouron Pharmaceuticals	12.8	-10.6	53	nm	def	def
Amgen	1,401.0	356.4	24	16%	25.4%	27.2%
Biogen	149.3	32.4	10	-15	21.7	28.4
Centocor	80.1	-74.4	-41	nm	def	def
Cephalon	18.7	-19.2	54	nm	def	def
Chiron	317.5	18.4	29	nm	5.8	def
Cytogen	12.3	-29.2	-28	nm	def	def
DNX	23.7	-19.4	218	nm	def	def
Genentech	649.7	58.9	19	183	9.1	3.8
Genetics Institute ^c	107.8	-16.9	23	nm	def	def
Gensia Pharmaceuticals	33.4	-63.3	-5	nm	def	def
Genzyme	280.1	-6.1	20	nm	def	def
Immune Response	9.1	-15.7	-18	nm	def	def
Immunex ^d	96.0	-361.7	nm	nm	def	def
Isis Pharmaceuticals	12.1	-19.1	12	nm	def	def
Liposome	13.0	-22.5	20	nm	def	def
MedImmune	16.8	-13.2	9	nm	def	def
Oncogene Science	16.6	-3.4	36	nm	def	def
Scios Nova	54.2	-36.6	70	nm	def	def
Synergen	23.5	-86.6	-54	nm	def	def
T Cell Sciences	10.7	-7.8	-19	nm	def	def
U.S. Bioscience	8.2	-40.6	-28	nm	def	def
Vertex Pharmaceuticals	29.3	2.0	409	nm	7.0	def
Vestar	35.1	-4.6	16	nm	def	10.3
Xoma	4.2	-31.3	-60	nm	def	def
AGRICULTURAL						
Biosys	9.6	-12.9	111	nm	def	def
Calgene	32.1	-35.7	24	nm	def	def
Crop Genetics	3.9	-8.5	-4	nm	def	def
DNA Plant Technology	10.3	-33.9	-14	nm	def	def
Ecogen	19.7	-11.9	119	nm	def	def
EcoSciences ^e	5.9	-9.4	478	nm	def	def
Mycogen	123.9	-45.2	226	nm	def	def

^a Includes product sales, contract research, royalty, and interest revenues for calendar year. ^b After-tax income as percentage of revenues. ^c Fiscal year ends Nov. 30. ^d For seven months from June 2 through Dec. 31, 1993, after merger with oncology business of Lederle Laboratories. ^e For year ending June 30. nm = not meaningful. def = deficit.

According to the Cambridge, Mass.-based consulting firm Feinstein Partners, biotechnology firms raised \$2.8 billion in 1993. In comparison, \$2.5 billion was raised in 1992, and \$3.4 billion in 1991, the most lucrative financing year in the industry's history. Even though the amount raised in 1993 was close to that of earlier years, the average size of deals was down 30 to 40% from 1991 levels and a greater number of deals were financed privately.

The darkest months in 1993 were those leading up to the announcement of President Bill Clinton's health care proposal, says Peter Feinstein, presi-

dent of Feinstein Partners. Like numerous other consultants, analysts, company executives, and industry representatives who spoke out during 1993 and in 1994, Feinstein underscores the negative effect that uncertainty about health care reform and the prospect of de facto drug price controls are having on the biotechnology industry.

Much of the industry's energy and that of its trade association, BIO (Biotechnology Industry Organization)—formed from the merger of two industry groups in 1993—has been focused on health care reform. Even so, companies have continued to produce impor-

tant innovative therapies and products. Some of these new biopharmaceuticals, which brought the total up to 20 approved to date, are poised to make significant gains throughout 1994.

Two Factor VIII blood-clotting products for hemophilia were on the market by early 1993. In late July, β -interferon, for treating multiple sclerosis, was granted U.S. marketing approval (C&EN, Aug. 2, 1993, page 5). And Pulmozyme (DNase), an enzyme for treating cystic fibrosis, received U.S. marketing approval early in 1994 (C&EN, Jan. 10, page 5).

FDA's rapid review of both Pulmozyme and β -interferon in under one year has made the industry hopeful that other products might move through the regulatory process more quickly. At least five products, out of more than 140 reported to be in human clinical trials or awaiting approval, are anticipated to be close to market. Product reviews are expected to move even more quickly as FDA's Center for Biologics completes its reorganization and hires the added staff made possible by newly implemented user fees.

Leading the industry in product sales is Amgen; its 1993 revenues increased 24% from 1992 to \$1.4 billion, and net earnings rose 16% to \$356 million. But Genentech leads in the number of biotechnology products it sells—five—and in being responsible for another five, including Monsanto's bovine growth hormone, sold by licensees. The firm's 1993 revenues grew 19% to \$650 million and earnings rose 183% to \$59 million.

Biogen's fifth consecutive profitable year can be attributed to the royalty income it receives on major biopharmaceutical products that had sales of \$1.5 billion in 1993. Revenues were up 10% to \$149 million, but earnings dropped 15% to \$32 million as the result of special one-time charges. The company hopes to bring its first two proprietary products to the U.S. market next year, which may increase expenses and again lead to mixed financial results.

Genzyme is anticipating FDA approval of a recombinant form of Ceredase before midyear 1994. The company's nonrecombinant enzyme, used for treating Gaucher's disease, contributed about \$124 million in sales to its \$280 million in revenues in 1993. While revenues grew 20%, its reported loss was only \$6 million.

For Chiron, the approval of β -interferon was a milestone as the first bio-

Biotech R&D spending levels are high

\$ Millions	R&D spending		As % of revenues	
	1993	1992	1993	1992
Amgen	\$255.3	\$182.3	18%	16%
Biogen	79.3	60.4	53	45
Centocor	66.1	106.6	83	79
Chiron	140.0	142.3	44	58
Genentech	299.4	278.6	46	51
Genetics Institute	102.1	90.1	95	103
Gensia	54.3	40.4	163	115
Genzyme	48.3	39.7	17	17
Immunex ^a	49.7	37.1	52	52
Medimmune	14.9	11.3	89	73
Scios Nova	39.5	29.9	73	94
Synergen	88.3	60.3	376	117
Xoma	26.9	30.1	640	287

^a 1993 figures for June 2 through Dec. 31, after merger with oncology business of Lederle Laboratories.

pharmaceutical product developed, rather than acquired, by the company. Sales are expected to grow substantially for the product, and the company is adding production capacity; capital spending reached \$155 million in 1993 and is ex-

pected to continue at this level in 1994. Demand for β -interferon has been strong and the company hopes to produce enough for double the number of patients, up to 40,000, by the end of 1994, and more than 100,000 in 1995. Chiron reported a profit of \$18 million on revenues of \$318 million in 1993.

Factor VIII is bringing added royalty income to Genetics Institute, which had nearly break-even results in the fourth quarter of 1993. For the year, the company reported revenues of \$108 million, up 23% from 1992, and a net loss of \$17 million, down from a loss of \$37 million in 1992.

The biggest losses in the industry were reported by Immunex and Synergen. A \$346 million charge related to Immunex's merger with Lederle Laboratories' oncology business in early June contributed to a \$362 million loss for the June through December period.

Revenues for the same period in 1993 reached \$96 million. Synergen's losses increased to \$87 million in 1993, up from \$41 million a year earlier, while revenues dropped 54% to \$24 million, largely because of a decrease in R&D fund-

ing. In April 1993, the company moved to tighten its research focus and conserve resources.

For the first time in a few years, Centocor did not lead the industry in red ink. Centocor cut its losses in 1993 to \$74 million, down from losses of \$105 million in 1992 and \$196 million in 1991. Despite pulling Centoxin from the market, the company had revenues of \$80 million, down 41%. Its cost-saving measures, put in place in 1993, have been having an effect. The company expects 1994 to be a "turnaround" year, and to make a profit in 1995.

The agricultural side of the biotechnology industry continues to operate at an overall loss. But several major events in 1993 could set the stage for future industry growth. For example, regulatory approval was granted for bovine growth hormone and sales began in February. In March, the U.S. Department of Agriculture came out with a new policy on field trials of genetically engineered plants.

Even though they lack profits as a group, agricultural biotechnology companies did register substantial growth in revenues in 1993. Both EcoScience and Biosys had large increases in revenues starting from very small base levels. EcoScience's more than 100% jump largely was due to contract revenues and biopesticide product sales that more than doubled to \$7.2 million. Although its product sales grew, DNA Plant Technology's (DNAP) revenues dropped 14% to \$10.3 million.

Increased expenses and acquisition of DuPont's interest in a joint venture contributed significantly to DNAP's \$34 million loss. Calgene's loss of about \$36 million, on revenues up 24% to \$32 million, also stemmed from increased expenses as the company positions itself for the anticipated launch of its genetically engineered tomato and cotton in 1994.

Mycogen's revenues jumped 226% to \$124 million with the full-year effect of its majority interest in Mycogen Plant Sciences (formerly Lubrizol's Agrigenetics business). Earlier this year Mycogen expanded its ownership from 51% to just over 80%. Special restructuring and technology acquisition charges of \$38 million contributed to a loss of \$45 million, up from \$31 million in 1992. Mycogen Plant Sciences plans to test-market its first insect-resistant hybrid seed corn in the 1994 growing season, and the company expects to be profitable in 1994. □

Sales of major biotechnology products grew in 1993

Company	Products	Sales (\$ millions)	
		1993	1992
Amgen	Erythropoietin	\$586.9	\$506.4
	Granulocyte colony-stimulating factor	719.4	544.6
Biogen ^a	α -, β -, and γ -Interferons; hepatitis B vaccines and diagnostics	136.4	121.7
Centocor	Antisepsis monoclonal antibody ^b , diagnostic products	48.1	58.4
Chiron	β -Interferon ^c	11.8	nm
	Interleukin-2 and other oncology products, ophthalmics	147.9	111.6
Genentech	Human growth hormone	216.8	205.9
	Tissue plasminogen activator	236.3	182.1
	γ -Interferon	4.3	2.9
	Human insulin, α -interferon, and Factor VIII	112.9 ^d	91.7 ^d
Genetics Institute	Factor VIII ^e	41.3	nm
	Erythropoietin, granulocyte macrophage colony-stimulating factor (GM-CSF), Factor VIII	26.5 ^f	27.3 ^f
Genzyme	Therapeutics, fine chemicals, diagnostics products and services	233.9 ^g	180.0
Immunex ^h	Oncology products ⁱ	46.7	nm
	Granulocyte macrophage colony-stimulating factor	42.1	26.3

^a Predominantly royalty income from \$1.5 billion in sales by licensees. ^b European sales in 1992. Sales halted in January 1993. ^c Initial sales began in third-quarter 1993. ^d Royalties from licensees' sales. ^e Factor VIII approved for marketing December 1992; includes sales of product to marketing partner Baxter. ^f Royalties on overseas sales of erythropoietin and GM-CSF, and on U.S. sales of Factor VIII. ^g Includes about \$124 million in therapeutics sales of glucocerebrosidase. ^h Merged with oncology business of American Cyanamid's Lederle Laboratories in June 1993. ⁱ Sales of certain Lederle products between June 2 and Dec. 31, 1993. nm = not meaningful.

Export outlook modest for green technologies

Long ago, when Lyndon Johnson was President, his Office of Science & Technology issued a visionary report, "Waste Management and Control," recommending that industry design processes that convert toxic chemicals to benign products from the word go. The study was barely noticed.

It has taken a generation of chemists and chemical engineers to absorb the idea and convince their bosses that pollution prevention, or green technology, is good for the world and might also make them money. The field is now hotly competitive and may become a weapon in improving the country's trade balance.

But not quite yet, indicates Congress' Office of Technology Assessment. OTA has just issued a report, "Industry, Technology, and the Environment: Competitive Challenges and Business Opportunities," that explores the competitiveness outlook for environmental technology. As the report notes, the \$100 billion abatement and control technology market is doing very well, but the green technology field is still finding its way. At the same time, both could use a stronger export policy push from Washington.

Of more help are the two trade associations that have been formed in the field—the U.S. Environmental Business Council in Boston and the Environmental Technology Export Council in Washington, D.C.

Several bills have been introduced in Congress to spur the field. The National

Academy of Sciences and the National Academy of Engineering have conducted studies and held symposia on the subject and more are planned. In addition, the National Science Foundation, in a program begun by the late Kenneth G. Hancock, then NSF's chemistry division director, sponsors innovative research in the field.

Nevertheless, OTA says, process industries still think pollution prevention technology carries low-return capital costs. Companies still have to be nudged by regulation to take the extra innovative leap into sustainable approaches. According to Wendell Fletcher, the veteran OTA staffer who managed the study, "Most U.S. programs are very small. And only a handful consider pollution prevention in conjunction with other manufacturing needs, including energy conservation, productivity, and quality improvements."

As for export figures, where they are reliable at all, they are minuscule for a field that appears to have such vast potential. Most activity is, again, in abatement, and seems to go on inside national borders. The Organization for Economic Cooperation & Development ranks Germany as export leader with a \$10 billion surplus in 1992, the U.S. second with a \$4 billion surplus, and Japan third with a surplus of \$3 billion. The U.S. government, the report says, is far from establishing a set of coherent policies to spur the export effort. Still, the report continues, if such a commitment were serious-

ly undertaken, it would in time pay off. Commerce Secretary Ronald H. Brown says the global environmental technology market could run as high as \$600 billion by 2000.

The report was written from two specific market perspectives. One is that of the technologies that help companies comply with regulations—that is, technologies that treat or remove toxic emissions after they are produced. The other perspective is more exciting—technologies that catalytically turn toxic chemicals into benign entities in the production process itself, or don't produce any at all.

The former approach is "old-think," according to Fletcher. The new way to go is clearly in the direction of pollution prevention. "There is significant potential in pollution control technology," he says. "It is more cost-effective and would clearly make it easier for manufacturing firms to comply with environmental requirements. We see a shift toward what we call cleaner technologies."

Fletcher says, however, that people shouldn't expect much of a domestic job bonanza to accompany most of the technologies. The U.S. may export a lot of know-how abroad. But much of the construction will probably be done using local labor, materials, and parts. "Many of the jobs in this country," he says, "will be high-wage technical or engineering jobs." Another inhibiting factor in the U.S. export outlook, according to the report, is that most green technology firms are small or medium sized and have little export experience.

Several policy approaches are needed to give the field the nudges it needs, and there are many. First, it would help if all of the countries of the world adopted uniform environmental quality standards.

But more important, the right export infrastructure is still lacking in the U.S. Both Japan and Europe offer their firms much more export assistance than does the U.S. government. Moreover, the report adds, more assistance by various lending institutions is needed to help developing countries get better information about these new technologies.

Another approach would be for U.S. regulators to give top-level "environmental performers" more choice in the technologies they use. Yet another would be to integrate environmental objectives into the support the U.S. government already gives to manufacturing technologies. The report lists 33 options in all.

Wil Lepkowski

Estimates of global market size for environmental technologies vary, but U.S. is viewed as strongest competitor

	Organization for Economic Cooperation & Development (OECD)			Environmental Business International		
	Market size		Trade balance ^a	Market size		Product exports
\$ Billions	1990	2000	1990	1992	1997	1992
U.S.	\$ 78	\$113	\$ 4	\$134	\$180	\$ 7
Western Europe	54	78	8	94	132	na
Germany ^b	17	23	10	36	na	11
Japan	24	39	3	21	31	5
Other OECD countries	9	15	na	13	22	na
Eastern Europe/former U.S.S.R.	15	21	na	14	27	na
Other non-OECD countries	21	34	na	19	34	na
WORLD TOTAL	\$200	\$300		\$295	\$426	

^a Includes goods, services, and licenses. ^b Germany's share of Western Europe. The OECD estimate is for western Germany; about half of this number is exports. na = Data not available or separately listed. Source: Office of Technology Assessment

PERSONAL CARE PRODUCTS

The cosmetics and toiletries market—which includes myriad products from makeup and hair preparations to fragrances and dentifrices—has long been regarded as recession-proof. In other words, when the economy starts to slip, consumers may stop buying new cars, but they don't stop washing their hair.

Demand for products in the mature cosmetics and toiletries market has been slow and steady throughout the past several years as the recession has gripped U.S. businesses. In 1993, industry shipments increased more than 4% to \$18.8 billion, or 2% in constant dollars, the same rate of increase as in 1992. And the same growth is forecast for 1994, according to the Department of Commerce's U.S. Industrial Outlook report on cleaning preparations and cosmetics, released early this year.

Although companies that formulate and market cosmetics and toiletries may be ringing up sales at a constant pace, the slow economy has influenced the industry in other ways. During a recession, consumers look for value by buying more multifunctional products, such as shampoos that clean, condition, and add shine. They want products that will provide a proven benefit. Consumers also typically trade down to lower priced products. Consequently, the sluggish economy has adversely affected the industry's luxury and designer segment, the Commerce report

Demand for more creative ingredients rejuvenates an aging market

Susan J. Ainsworth, C&EN Houston

points out. At the same time, recession-driven downsizing programs and consolidations have trimmed back the human resources so crucial to cosmetics and toiletry companies.

As these leaner cosmetics and toiletries companies experience added pressure to provide more value to the consumer, they have been turning increasingly to their raw material suppliers for support. "Throughout the 1990s, as our customer [firms] continue to streamline their organizations, they have placed greater importance on the supplier to assist in new product development and product improvement through both new materials and technical support," says Salvatore J. Guccione, vice president and business director for personal care products at International Specialty Products, Wayne, N.J.

Companies that formulate and market cosmetics and toiletries are demanding better performing, more creative ingre-

dients at lower cost. "Recognizing that the consumer isn't going to pay high prices for something new and fancy, the marketplace wants the best technology at the lowest possible cost," says James F. Manier, business director for personal care products at Cranbury, N.J.-based Rhône-Poulenc's surfactants and specialties business unit.

From the point of view of the raw material supplier, the cosmetics and toiletries market "may be recession-proof in terms of [sales] volume, but not in terms of pricing or profitability," says Tom O'Brien, manager of surfactants sales in Vista Chemical's surfactants and specialties division in Houston.

This recession-driven pressure on raw material suppliers is not abating. They say they are only just beginning to feel the recovery that economists have been proclaiming.

In today's economy, suppliers have to be creative to meet formulators' cost and performance challenges and still remain competitive, says Frank J. Freiler, director of marketing for Union Carbide's Amerchol subsidiary, an Edison, N.J.-based specialty chemicals company serving the personal care and cosmetics industry. These challenges can "create opportunities for suppliers who are willing to go the extra yard in support of customers' needs."

In addition to providing cost-effective formulation solutions, suppliers can gain an edge in the marketplace by help-



National Starch researchers evaluate variety of personal care products.

ing their formulator customers develop more environmentally friendly products. Marketers are rethinking entire production lines in response to continuing consumer demands for clear and natural products that contain no animal by-products and are not tested on animals.

Likewise, raw material suppliers can capture additional growth by developing ingredients consistent with the changing demographics in the U.S. As the population ages, the demand for cosmetics with milder formulations, softer colors, and treatments for aging skin increases.

Indeed, suppliers of ingredients have had to be more innovative and industrious than ever to survive in today's intensely competitive marketplace. They have had to endure poor profitability over the past few years, says Larry Moss, vice president for household, per-

sonal care, and industrial products in Witco's oleosurfactants group, New York City. Customer companies have been demanding lower ingredient prices while "our raw material costs remained unchanged," Moss says. O'Brien adds, "Margins have suffered due to the poor economy and overbuilding of capacity around the world—and that's a real problem."

However, ingredient suppliers are beginning to sense an upturn in the economy. And they are hopeful that during the course of 1994 they will be able to "initiate the price increases that have been necessary for well over a year," says Moss. "We can't continue to absorb all of the costs by ourselves."

Suppliers to the cosmetics and toiletries industry are "guardedly optimistic" that recovery is on the way, says Janet C. Kosiek, product manager for specialty surfactants in the performance products divi-

sion of Lonza, Fair Lawn, N.J. "Things seem to have stabilized somewhat, and I get the feeling that marketers are not operating in such a frenzy."

Moss says he senses that customer formulators are a little bit busier and "not down in the doldrums as much." However, improvements in the economy and in the business are still touch and go.

Rhône-Poulenc's Manier adds: "You might go for three months doing just great and then all of a sudden it is the end of the next month and you wonder what has happened."

New product introductions, an important yardstick for measuring the extent of the recovery in the cosmetics and toiletries market, seem to be on the rise again. "Companies are apprehensive about introducing new concepts at any time, owing to the risk involved," says Judith Grey, director of marketing for Haarmann & Reimer's fragrance division, referring to the millions of dollars marketers must invest in advertising to launch a new product. "Certainly, in tight economic times this apprehension increases," she points out. However, Springfield, N.J.-based Haarmann & Reimer was among many companies that experienced an increase in the number of new products being introduced and developed in 1993.

"And this is expected to continue into the near term," says Amerchol's Freiler. As cosmetics and toiletries companies launch more new products, more demand for innovative chemistries and ingredients is created, which, in turn, generates opportunities for raw material suppliers.

Synergy and ingredients

To be sure, suppliers see opportunities in developing new raw materials that continue to give more bang for the buck. "Functionality is a macro-trend around the industry," says Freiler. "Products need to do more, and in some instances cost less. This is the value-oriented market approach that is based on products meeting, and not exceeding, the needs of the consumer at a lower price."

With the cost pressures that ingredi-

U.S. raw material suppliers look to developing nations for growth

As the Cosmetic, Toiletry & Fragrance Association, Washington, D.C., celebrates its centennial anniversary this year, it serves as one more reminder that the U.S. personal care industry is well into its mature years. Although changes in the cosmetics and toiletries market continue to create new niche opportunities, overall demand for cosmetics and toiletries generally tracks gross domestic product growth.

Therefore, it's no surprise that U.S. cosmetics and toiletries producers and their raw material suppliers are increasingly looking beyond the nation's borders. "The cosmetics industry is recognizing that globalization and meeting the differing demands of consumers around the world are the keys to competitiveness in the marketplace," according to the Department of Commerce's U.S. Industrial Outlook report on cleaning preparations and cosmetics, released early this year. "Cosmetics and toiletry companies and their suppliers are becoming increasingly global through constant acquisition, consolidation, and reorganization," the report

says. "Corporate investment strategy, advertising, and R&D are shifting from an emphasis on domestic markets to international markets."

Long-term prospects for exports of U.S. products look most promising in Latin America and the Asia-Pacific region, especially China and Japan. The Commonwealth of Independent States (the former Soviet Union) and Eastern Europe also offer opportunities for trade expansion. However, these opportunities will be limited over the near term because of lack of hard currency, the report adds.

Raw material producers point out that even in Latin America and the Asia-Pacific region, market opportunities are limited for now. "Short term, growth has been below expectations and it's anybody's guess as to when the markets will pick up," says Tom O'Brien, manager of surfactants sales in Vista Chemical's surfactants and specialties division, Houston. "People in developing nations are still worrying about eating and cleaning their clothes so, understandably, personal

care products are not yet a high priority," he says.

Slow or declining growth in demand for personal care products has been responsible for delivering disappointing returns for companies investing in developing nations. In addition, it has contributed to an oversupply problem for certain raw materials, such as linear alcohols. Additional product produced in anticipation of demand growth in developing nations is now being shipped to developed nations, creating a glut of some products, says O'Brien.

Still, companies investing in developing nations now are going to have a long-term advantage, O'Brien concedes. They will be firmly established long before some of their competition when growth begins to climb.

Indeed, forward-thinking U.S. companies are laying claims to international markets both by increasing exports to those regions and by setting up or expanding operations there. According to the Commerce report, exports of personal care products from the U.S. grew 14%

ent suppliers have been enduring for several years, it has been difficult for them to offer less expensive products. Therefore, suppliers have been looking at how they might put raw materials together to create certain synergies in formulations, says Witco's Moss. "They want to know if one and one can equal three instead of two," he explains.

For example, along with an alkanolamide, which is traditionally added to build viscosity and foam, Witco might add a betaine, which gives a formulation the mildness that is so much in demand right now in personal care products. Even while the less expensive alkanolamide does the majority of foam and viscosity building, "a little bit of betaine allows a company to claim it has a low-irritation formulation," says Moss. "Plus, because most of our betaines are made from vegetable-based sources, their addition to a product might allow customers to tout a product as natural."

In an effort to cash in on this trend, in February Rhône-Poulenc launched its Miranol Ultra C-32, an amphoteric surfactant for personal care products that enhances the performance of other surfactants in a formulation, Manier says. For example, "a customer might

be able to substantially reduce or eliminate other key traditional ingredients (such as hydrotropes) with the addition of Miranol Ultra, which enhances the detergency, foaming, and mildness of a formulation."

Based on a patent-pending technology, Miranol Ultra can be used to create products with a higher actives-to-solids ratio, reducing the by-product profile, according to Michael L. Finney, director of commercial development for Rhône-Poulenc's surfactants and specialties business unit. Most amphotericics now on the market, such as glycinate, have an actives-to-solids ratio of about 60%, whereas these new products have a ratio of more than 80%. The high actives-to-solids ratio leads to reduced viscosity, which makes the product easier to pump and handle in manufacturing. This allows customers to formulate products with higher levels of active ingredients while offering superior consistency and stability. More cost-effective formulations likely will be much easier to attain with this new product, adds Finney.

In the area of ingredient synergies, Witco is doing more application work and some basic R&D at both its Chicago

and Dublin, Ohio, personal care laboratories, says Moss. "In addition, we are working closely with our European surfactant groups in this area. This will allow us to keep up with the latest trends in Europe, which tend to eventually show up in the U.S."

Witco has stepped up its application work not just in ingredient synergies, but across the board, says Moss. "Customers are not in a position to do as much [of this work] as they used to," especially after major downsizing programs. "They need to get products out onto the shelves faster and so they are depending on their raw material suppliers to give them more support."

In addition, the cosmetics and toiletries companies want proof, in the form of product information, that the ingredients they are buying meet their needs. It is increasingly critical in the new product process for a supplier to be able to tell a formulator what its new ingredient can do that "one of the 6,000 ingredients" currently available does not, says Freiler.

Today, resource-short marketers have to lean more on suppliers. Estée Lauder, New York City, for example, recently turned to Hopkinton, Mass.-based Zy-

last year, accounting for roughly 7% of total product shipments.

Eager to tap growth in developing nations, just last year National Starch established regional technical centers in Singapore and Brazil to service the Southeast Asian and South American markets, respectively, says John Mooney, the company's business director for specialty polymers.

International Specialty Products, Wayne, N.J., maintains sales representation covering every major market in the world, notes Salvatore J. Guccione, the company's vice president and business director for personal care products. Supporting those sales are three labs in the U.S., two in Europe, and one in Singapore. The company "is well positioned to capitalize on growth in the Asia-Pacific market" because it has been opening sales offices there over the past 10 to 15 years, he adds. International Specialty Products also plans to open new sales offices in China, Vietnam, Indonesia, and India sometime in the future. For Latin America and South America, the company maintains direct

sales representation in Mexico, Argentina, Brazil, and Venezuela; it has also just opened a personal care technical service lab in Brazil. "This structure allows International Specialty Products to participate effectively in the regions of anticipated growth."

Similarly, Vista Chemical maintains a sales force in Latin America, a sales office in Singapore, and an office with sister company Condea in Tokyo. In addition, last summer Vista licensed technology to the Chinese government for the construction of a 100,000-ton-per-year α -alcohols plant at Jilin City in northeastern China. All of the plant's production will be consumed within China to make personal care and other products. Vista is not a joint-venture partner in the plant, but O'Brien says it is "evaluating further business opportunities" at Jilin.

Witco, too, is expanding its participation in developing countries. One objective of a companywide restructuring program completed last year was "to better define how we will expand and develop on a global basis," says Larry Moss, vice

president for household, personal care, and industrial products within Witco's oleosurfactants group, New York City. The company has established sales offices in Sao Paulo, Brazil, and New York City to handle South American and Latin American markets. In the Asia-Pacific market, Witco has set up a sales office in Singapore, "where we expect to have manufacturing capabilities within the next 18 to 24 months."

Multinational company Lonza is another raw material producer that has set up a string of distributors and agents throughout Latin America and the Asia-Pacific markets, says Janet C. Kosiek, product manager for specialty surfactants in the performance products division of Lonza, Fair Lawn, N.J. "As the cosmetics and toiletries business becomes more global, there will be less emphasis on regional purchases and more focus on the growing markets around the world." Simply put, she says, "You will have to be able to compete in those markets because if you just want to compete in your own country, you are going to be left out."

mark Corp., a leader in the field of laboratory automation. Estée Lauder needed a robotic system that could perform preservative challenge tests to determine the efficacy of preservatives used in cosmetic formulations. Testing preservatives requires that large volumes of samples be analyzed repeatedly under the same conditions, making it a highly labor-intensive and repetitive task that consumes many employee hours, says Steve Schnitger, a group leader at Estée Lauder's Melville, N.Y., laboratory. The automated robotic system can effectively perform this function, "freeing up the microbiologist to perform more creative tasks."

Formulators have no choice but to be more trusting of the quality and performance data that their suppliers provide with their raw materials, opting to skip tests that would check such information. This allows formulators to focus on their primary goal: selling their finished products, Moss adds.

Indeed, raw material suppliers say they are doing more for their formulator customers today than ever before. For example, Hüls America in Piscataway, N.J., "has focused more of our activity on service, ranging from responsive ap-

plication assistance to adjusting inventories to meet just-in-time delivery requirements," says Barbara Pagliocca, the company's marketing and sales manager for personal care products.

To better meet formulators' changing demands, International Specialty Products has created market-focused business units. In addition, in 1993 the firm's personal care business unit—which handles hair care resins, preservatives, ultraviolet absorbers for sunscreens, pearlescent pigments, emollients, and emulsifiers—expanded its R&D and technical service departments.

Clearly, suppliers today must focus on making things as easy as possible for their customers who formulate and market cosmetics and toiletries.

Convenience of blends

In keeping with this trend, raw material suppliers say they are selling more convenience products such as finished blends and concentrates. With one of these products in hand, a formulator might need only to make an adjustment in the viscosity and add color and fragrance to arrive at a ready-for-market formulation, says Moss.

"Proprietary blends" that are tailored

for a particular company are now becoming more popular. Many times formulators will define what they want in a blend and the cost they are willing to pay before they deal with their suppliers, Lonza's Kosiek adds. Formulators may use one of these proprietary blends as the basis for multiple product lines.

Blends also bring cost savings. When relying on finished blends, these companies don't have to maintain big, expensive inventories of chemicals; they don't have to worry about the inherent costs in making a bad batch; and they can dispense with quality checks on long lists of ingredients. Furthermore, they can operate with fewer employees and they don't have to make a big investment in "pots and pans," says Moss.

Also, blends allow formulators to gain economies of scale, adds Lonza's Kosiek. For example, formulators might get to a finished product simply by diluting a blend rather than combining six ingredients. Therefore, companies can increase their rate of processing and their capacity without investing in additional equipment. In addition, blends often bring together many different functionalities in a single formulation, an attractive trait to marketers who are trying to

Anionics are most widely used surfactants in personal care products

Millions of lb	Consumption				% annual change	
	1982	1987	1992	1997	1982-92	1992-97
Anionics	229	335	455	525	7.1%	2.9%
Nonionics	35	47	60	80	5.5	5.9
Cationics	35	50	65	80	6.4	4.2
Amphoterics	13	18	26	35	7.2	6.1
TOTAL	312	450	606	720	6.9%	3.5%

Note: Excludes surfactants used in soaps. Source: Freedonia Group

satisfy consumers with multifunctional products.

The proliferation of multifunctional products such as shampoo-and-conditioner combinations is also creating opportunities for surfactant manufacturers. Frequently, combination products compromise the qualities of the various components by interacting adversely with other ingredients, says a 1993 report on surfactants by the Cleveland-based consulting firm Freedonia Group. Demand is up for surfactants that are compatible with other materials and that can enhance product effectiveness.

Two-in-one products are increasingly incorporating amphoteric surfactants—like Lanza's Amphoterger K2—that are compatible with anionic, nonionic, and cationic surfactants, says Kosiek. Amphoterics can help to solubilize cationic conditioning agents so that they are more easily incorporated into an anionic shampoo system, she adds.

'Cosmeceuticals' take hold

Just as consumers are driving the trend toward multifunctional ingredients, they are also creating demand for products with demonstrable benefits. "More than ever, cosmetic raw materials are being evaluated by what they can do to provide not only a good look but also some type of health benefit," says Gary Romans, director of marketing for the aroma chemicals division of Haarmann & Reimer.

Three market forces seem to be driving the trend toward products that medicate as well as beautify. For one, more educated consumers are demanding products based on sound science, says the Commerce Department report. Second, the average age of consumers is rising, creating demand for more therapeutic products to care for older skin. And third, the recession may also have fueled

demand for these types of products.

"Before the recession," says Lanza's Kosiek, "people had enough discretionary income to allow them to buy and try six or seven products before they found one they liked. Now, I think people want to be sure that the single product they purchase is going to

work for them." The Commerce report expects that, despite predicted recovery in the economy, this trend will continue into 1994 "as cosmetics become 'cosmeceuticals.'"

Developing such products creates challenges for raw material suppliers and formulators alike, but the investment may be worth it. For instance, using science to create new products has paid off for the sunscreen market, which now has annual U.S. sales exceeding \$500 million, the Commerce report points out. Similarly, sales of therapeutic skin care products, such as those containing vitamins, free-radical scavengers, and especially α -hydroxy acids, have skyrocketed.

Hair care marketer Zotos, Darien, Conn., has responded to the demand for more scientifically based products. This past summer the firm introduced its patented Senscience line of hair care products that contain an inner cellular membrane complex that mimics hair's own cell membrane to restore strength

and body, says Thomas M. Schultz, Zotos' vice president of research and development.

Over the past few years, cosmetics companies have begun using fruit acids (organic acids including citric acid, malic acid, lactic acid, and glycolic acid) to formulate a bevy of new products such as Avon's Anew moisturizer. In the proper concentrations, fruit acids exfoliate dead skin cells leaving skin smoother and tighter with a more youthful appearance, says Mark P. Conlon, marketing manager for Haarmann & Reimer's food ingredients division in Elkhart, Ind. Cosmetics formulators also report that fruit acid treatments result in a reduction of liver and sun spots as well as diminution of wrinkles.

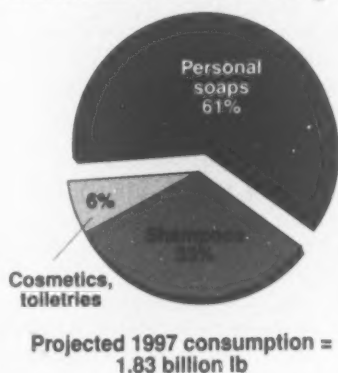
Natural products

Another advantage that α -hydroxy acids bring to cosmetics and toiletries companies is that they are perceived as natural by the consuming public. That's important as consumers become more concerned about synthetic and animal-derived products. For example, glycolic acid is touted as natural to sugarcane and sugar beet; lactic acid is claimed to be natural to sour milk; citric acid is said to be natural to fruits and vegetables and most living organisms; and malic acid is natural to apples and grapes.

In reality, commercial glycolic acid is produced as an intermediary in the manufacture of ethylene glycol through the reaction of formaldehyde with carbon monoxide. Malic acid is derived from the reaction of maleic anhydride with water. Only citric acid and lactic acid are produced from natural fermentation processes generally utilizing corn or sugar substrates. According to Conlon, Haarmann & Reimer is the leading global producer of citric acid and malic acid grades that are used as the acid basis for personal care products.

The cosmetics and toiletries industry often takes liberties with the term natural because products with this label can be sold at a premium price. However, not all products labeled as natural contain an extract, such as aloe, in a minimally processed form. A coconut-oil-derived surfactant may be deemed natural even though it is just as highly processed as a "synthetic" ingredient derived from petrochemical sources. The issue should not be whether an ingredient is based on a renewable resource, say many companies. Instead, the cosmetics and toiletries

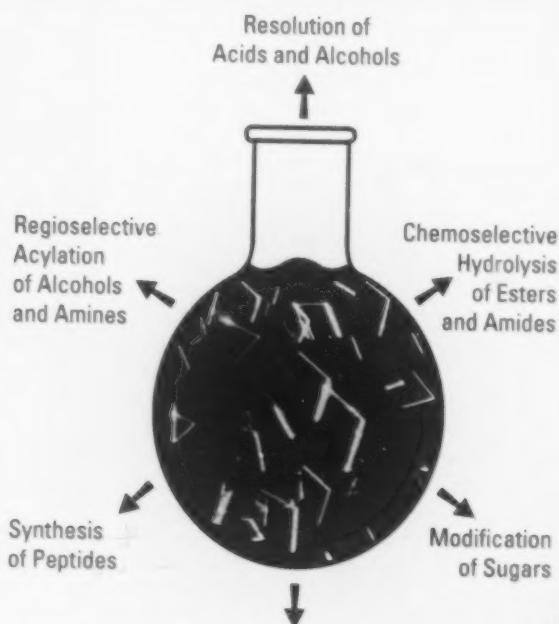
Most personal care surfactants used in soaps



Source: Freedonia Group

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industry has begun to focus on how the ingredient affects the environment as it is processed, used, and discarded.

Life-cycle analysis

Although many raw material suppliers support the life-cycle analysis concept in theory and would gladly dispense with the oversimplified use of the terms natural and synthetic, they also point out that providing a complete life-cycle analysis for an ingredient may not be practical. Developing a full environmental impact profile for an ingredient would take years and a great deal of capital, says Witco's Moss. It requires re-tracing the processing of an ingredient, noting such details as to even how water was processed at a particular step in a raw material production process. What's more, suppliers don't always have control over factors that affect a product's life cycle, he says. "If customers wanted to have a life-cycle analysis profile of everything that they bought, they would not be buying very much."

Marketers may not yet be sure about what constitutes a natural or environmentally friendly product, but they are sure about one thing: They can sell their products much more quickly if

they can put the word natural on their labels. For example, Blaine, Minn.-based Aveda has built its entire personal care product portfolio around "pure flower and plant essences and other natural elements" with much success. This month, Aveda is launching a new lip color based on a plant pigment harvested from uruku trees growing in the Brazilian rain forest. Aveda says its products are not tested on animals and contain very few animal by-products.

The naturals movement has been a boon to raw material producers who are able to sell ingredients that are perceived as natural. Pagliocca of Hüls America says: "We have experienced above average growth over the past several years, particularly for our coconut-oil-derived products, as a result of the current industry trends" and the growth potential for these products is expected to remain high.

Similarly, Henkel reports increased customer interest in its Plantaren alkyl polyglycoside surfactants, which are made from glucose derived from corn and fatty alcohols derived from coconut and palm-kernel oils. These surfactants are used in a wide variety of products from facial cleansers to bath products to

shampoos. In addition, growing demand for natural products prompted the company to introduce its Gluadin almond protein hydrolysate, which is derived from enzymatically degraded almond flour and is used to improve moisturization, product feel, and mildness in personal care products.

Renewed interest in the use of all-natural ingredients is one factor spurring growth in sales of waxes. Demand for waxes used in cosmetics and toiletries applications is expected to grow 6.7% per year to \$180 million in 1997, according to another Freedonia report on natural and synthetic waxes. Cosmetics have historically included natural waxes in a variety of products ranging from lipsticks and makeup preparations to creams and lotions based on emulsions.

As formulators and marketers add more plant-derived ingredients to their products in an attempt to profit from the naturals trend, they are also benefiting from sales of products that consumers sense to be "greener." For example, in the past year consumers have gravitated toward clear products simply because they perceive them to be more natural, when, in fact, they generally are formulated no differently than

PRODUCT REPORT

their colored counterparts. In 1993, the industry has introduced clear deodorants, hair gels, face cleansers, and mouth washes, for example.

Picking up on this trend, in June last year PPG Specialty Chemicals, Gurnee, Ill., a subsidiary of PPG Industries, introduced a highly water-soluble surfactant from which clear liquid products can be readily formulated. The product, an ammonium cocoyl isethionate, has many of the same performance properties as PPG's sodium cocoyl isethionate, including mildness, high foaming, lubricious lather, and soft skin.

Likewise, Lonza is using its light-colored Amphoterger amphoteric surfactant as a stepping stone into the clear hair care products market. "It is also easier to formulate a blue shampoo, for instance, if you start with a light-colored product as opposed to something with a yellow tint that tends to give you a green finished product," Kosiek says.

Changing the fragrance of products so that they smell more environmentally friendly is another way formulators have capitalized on the green movement. For example, marketers of skin care products are replacing traditional citrus and flower scents with herbal scents to satisfy changing consumer tastes while maintaining all-natural formulations, according to yet another Freedonia report on flavors and fragrances. For this reason, demand for fragrances used just in the skin care segment will grow faster than demand for fragrances used in all cosmetics and toiletries, which is expected to increase 9.2% annually to \$885 million in 1997, according to the report.

Longevity of natural craze

Although raw material suppliers agree that natural is a buzzword in cosmetics now, they are divided in their

opinions about its longevity. "Judging from the number of phone calls that we have received from customers asking about the origin of our raw materials, I think that the natural trend will continue for a while," says Patricia A. Mayer, marketing manager for Henkel's Cospha division, Ambler, Pa.

However, Vista's O'Brien believes that the trend will die down in the cosmetics market over time, especially when feedstock economics dictate such a shift to synthetic raw materials. "For example," he says, "today there's an oversupply of both oleochemical-based and petrochemical-based alcohols, so suppliers are working hard to try to sell their respective products.

And if customers can get both at an equal price, today they may lean toward the one they can call natural, because it allows them to charge more or to avoid the whole natural-versus-synthetic issue."

But improvement in the economy and increased demand for all alcohols will trigger a shortage of one or the other, and then natural versus synthetic will become a nonissue, he says. "Marketers like to sell their products at a premium, but they are not going to pay a premium for their raw materials."

Natural raw materials may eventually fall out of favor because some—particularly botanicals—are more difficult to work with than synthetics. For starters, natural ingredients are many times less uniform and pure than a synthetic counterpart, points out Dante

J. Rutstrom, principal technical representative for formulation products at Eastman Chemical in Kingsport, Tenn. Botanicals, for instance, vary in composition because of seasonal and geographic factors, sometimes producing inconsistent lots, which is a problem for cosmetics formulators.

Natural ingredi-



ISP manager uses "rotovap" to remove low boiling liquids and recover solids in cosmetics testing.

ents are also threatened by microbial contamination as they are collected, extracted, purified and stored—a problem that does not occur with synthetics, which can be processed aseptically. In fact, animal, mineral, and botanical ingredients serve as nutrients for different microbial strains.

In addition, natural ingredients are more likely than synthetics to cancel out or clash with other ingredients in a formulation. For example, α -hydroxy acids require lower pH levels to function in a formulation. Although Henkel does not supply fruit acids, it has been "actively working with customers to help them formulate around these requirements," says Mayer.

In skin care, some natural fragrance ingredients must be separated from other components to avoid adverse ingredient interactions, according to the Freedonia flavors and fragrances report. As a result, microencapsulated fragrances are increasing their presence in the market.

Recognizing the limitations of formulating with natural ingredients, Hüls says it has done the testing necessary to show that its naturally derived fatty acid esters, which are being used more and more in both skin care and decorative cosmetics, are fully compatible with the other currently popular ingredients, such as α -hydroxy acids, botanicals, and extracts. Likewise, Henkel says naturally derived surfactants such

Perfumes and colognes consume most flavors, fragrances used in cosmetics

\$ Millions	Consumption				% annual change	
	1982	1987	1992	1997	1982-92	1992-97
Perfumes and colognes	\$134	\$271	\$366	\$555	10.6%	8.7%
Skin care products	52	104	148	240	11.0	10.2
Other	20	37	57	90	11.0	9.6
TOTAL	\$206	\$412	\$571	\$885	10.7%	9.2%

Source: Freedonia Group

PRODUCT REPORT

as its Plantaren line are made to exacting standards and, unlike botanicals, are easy to work with and generally compatible with other ingredients in formulations.

Natural waxes are sometimes incompatible with modern cosmetic ingredients, including short-chain esters and silicone, according to Freedonia. As a result, manufacturers are working to develop synthetic products that meet the needs of cosmetics formulators and address the problems associated with natural products. For example, Croda has developed a line of synthetic waxes based on fatty acids that can be used in cosmetics. These products allow formulators to avoid variances in quality, availability, and price while providing key performance characteristics.

Milder products

Consumers are also more likely to experience an allergic reaction to natural ingredients. This can be a real drawback for marketers because consumers are increasingly demanding milder formulations. Growth in the nation's elderly population and a growing consumer awareness of skin disorders are two major factors spurring popularity of milder products.

This trend has also sent raw material suppliers back to their research labs to develop gentler ingredients, such as nonirritating surfactants, suitable for this growing market. Some of the milder specialty surfactants used in toilet soaps include those based on fatty isethionates, lauryl ether sulfates, sulfo-succinate fatty acids, and sodium cocoyl isethionate.

Recognizing the growing demand for mild cleansing surfactants, late last year Rhône-Poulenc expanded production of sodium cocoyl isethionate at its Winder, Ga., plant. In addition, "we are working on development of lauryl phosphates, which are extremely mild and high-foaming ingredients used in the formulation of facial cleansers," says Manier. Although phosphates are a concern in the laundry detergents market where they have a reputation for encouraging eutrophication of lakes and streams, these specialty phosphates do not cause the same problem because they do not produce high levels of free phosphate in solution as do household laundry detergents, he says. In addition, the specialty phosphates are used at much lower levels in per-

sonal care products than in laundry formulations, he points out.

Demand for surfactants used in shampoos, cosmetics, and toiletries is forecast to increase 3.5% annually to 720 million lb in 1997. However, sales of surfactants that can help satisfy continuing demand for improved natural-based and milder formulations will grow faster than average, according to Freedonia's surfactants report.

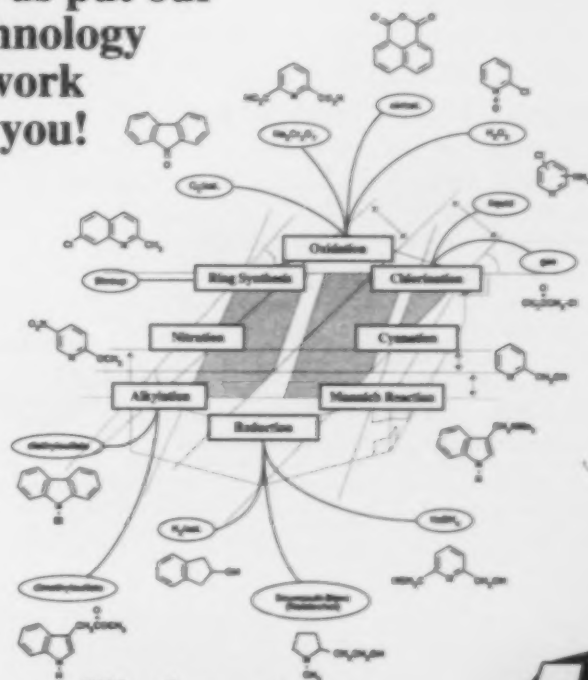
In the shampoo market, marketers have been changing formulations to improve mildness as well as impart a "luxury" feel to the hair, Freedonia says. As a result, anionic lauryl ether sulfates and other surfactants have begun to displace other anionics, such as alcohol sulfates, which have traditionally dominated the shampoo market. The most dynamic growth, however, has been in specialized cationics and amphoteric, such as imidazolines, betaines, and betaine derivatives.

The move toward milder shampoos has been good news for Vista Chemical, which is now making a concerted

effort to expand its business in the cosmetics and personal care market. Because the company's Novel II narrow-range linear alcohol ethoxylates are milder than the industry's conventional alcohol ethoxylate counterparts, more customers are using them in their shampoo formulations, O'Brien says. The mildness trend has also supported demand for a line of Guerbet alcohols, esters, and other derivatives that Vista introduced this past January. The high-purity C_{12} - C_{14} alcohols are used to meet oily-component requirements in cosmetics, personal care products, and other end uses, says Jordan Layer, national marketing coordinator for cosmetics and specialties at Vista.

Expanding on the mild luxury product theme, body shampoos are attempting to break into the U.S. market after much success in Europe. After completing some test marketing early this year, Andrew Jergens Co. in Cincinnati has launched its Jergens Refreshing Body Shampoo, a new nonsoap liquid cleansing system. The product,

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PRODUCT REPORT

which comes with a unique sponge, is intended to be a replacement for bar soap used daily in the shower or bath. "Test market results were very encouraging," says Tim Zimmerman, senior vice president of marketing at Jergens. The launch will be supported with a \$50 million consumer and trade marketing plan that began last month.

In addition, a month ago Procter & Gamble began test marketing its body shampoo, Oil of Olay Moisturizing Body Wash, in Spokane, Wash. The body shampoo holds promise for marketers that are looking for a new marketing concept for 1994 "and we are ready to help manufacturers develop these formulations," says Henkel's Mayer.

It may create some opportunities for raw material suppliers, too. For example, Jergens' body shampoo is based on Rhône-Poulenc's new Miranol Ultra C-32 product. In response to growing demand for the amphoteric surfactant, the company last year boosted capacity for the ingredient at both its Dayton, N.J., and Mississauga, Ontario, Canada, plants. Henkel already is active in the body shampoo market; at least one of its customers has launched such a product formulated with Henkel's Plantaren surfactant.

In addition to seeking improved mildness, formulators will continue to demand greater functionality, higher value, and more detailed product information to back up those claims, says Freiler. In today's high-cost environment, performance data are increasingly critical to formulators who cannot afford to have unsuccessful product introductions. "In the future," Freiler adds, "fewer raw materials may make it to market, but those that do will have a greater reason for existing and an excellent chance of success."

Regulatory concerns

In addition to pleasing consumers by providing products that are economical, environmentally friendly, mild, and tailored to the changing demographics of the U.S. population, the cosmetics and toiletries industry must also address its share of legislative concerns.

Despite being largely self-regulating, the industry has been watching the Food & Drug Administration (FDA) more closely than ever over the past year. After surviving the transition to the Clinton Administration, FDA Commissioner David A. Kessler "is now free to take



Hensel photo

action that would never have survived scrutiny in the Bush Administration," says Peter Barton Hutt, outside counsel at the firm of Covington & Burling for the Cosmetic, Toiletry & Fragrance Association (CTFA), the 100-year-old trade group representing almost 500 cosmetics and toiletries marketers and raw material suppliers.

For example, the agency has more strictly enforced compliance to good manufacturing practices, shutting down some plants entirely, adds Hutt. "FDA's increased focus on implementing over-the-counter drug review represents a major regulatory threat for the cosmetics industry."

CTFA has been successful so far in fighting legislation that would give FDA more power over the cosmetics industry. Congress has been considering legislation that would dramatically increase FDA's inspection and enforcement powers. "Fortunately, that bill went nowhere last year," says Michael J. Petrino, CTFA's vice president of legislative relations.

CTFA also worked hard last summer to defeat a proposal that aimed to establish user fees on all FDA-regulated industries. "This would require our companies to register their facilities and products with FDA and pay annual registration fees to boot," Petrino says. Although the FDA enforcement bill is likely to remain dead for this year, the Administration is going to continue to push for user fees in the future, especially in light of FDA's budget problems, he predicts.

In 1994, the cosmetics industry will be paying particular attention to FDA's

stance on the distinction between cosmetics and drugs. Responding to consumer demands, cosmetics and toiletries producers are turning out more efficacious products that sometimes straddle the line dividing cosmetics and drugs. As a result, FDA has begun to monitor these products more closely, focusing particularly on three areas: sunscreen products, dental products, and products containing hormone ingredients.

After 15 years of relative inactivity in the area, FDA issued a 100-page proposal on sunscreens, suggesting that they should be regulated as any other over-the-counter drug. In its current form, the proposal will target products used at the beach as well as traditional cosmetics products—skin care, color, and hair care products—that now contain sunscreen ingredients.

Meanwhile, FDA's Dental Products Panel is looking at whether antiplaque products should be considered drugs or remain categorized as cosmetics. Separately, this past September, FDA proposed that products containing hormone ingredients above a certain level are drugs, regardless of the claims made for the product. CTFA is actively working to provide evidence showing that these products should remain under the self-regulated classification of cosmetics.

CTFA survived another close encounter with FDA concerning hair dyes. Responding to media reports questioning the safety of hair dyes, last year Rep. Ron Wyden (D-Ore.) asked the General Accounting Office (GAO), the investigative arm of Congress, to

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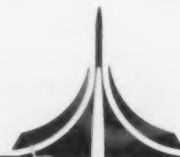
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look at the issue, particularly FDA's regulatory authority over those products. GAO met with FDA and CTFA and decided to terminate the investigation in mid-1993. Following that, a study conducted by the American Cancer Society published in the Feb. 2 issue of the *Journal of the National Cancer Institute* showed that there are no credible links between hair dye use and cancer. FDA came to the same conclusion.

On another front, the industry continues to fight to keep up with a growing number of state air quality regulations. In steps implemented during the past five years, the California Air Resources Board has required the reformulation of several products including hair care products and antiperspirants and deodorants in an attempt to reduce their concentrations of volatile organic compounds (VOCs) that are said to contribute to smog.

Following California's lead, last year Arizona, Texas, and Rhode Island each moved toward wholesale adoption of the California regulations. As additional states join the fray, they likely will adopt regulations that vary from those in California, making it more difficult for producers to keep up with them, says CTFA's vice president and general counsel, Thomas J. Donegan. This issue "underscores the need for national uniformity of regulations."

To help cosmetics and toiletries companies proactively respond to the demands that these regulations might have on their businesses, National Starch, as a supplier of ingredients, is focusing much of its efforts in the development of new polymers and systems for low-VOC products, says Barry Lothian, the company's business manager for personal care polymers. For example, in late 1993 National Starch introduced Lovocryl 47, a polymer that helps overcome many of the problems of formulating with water in low-VOC hair sprays.

While the industry grapples with regulations relating to outdoor air quality, it is also monitoring growing concern about indoor air quality. Regulators are focusing on asbestos and secondhand smoke as well as the use of everyday products, like cosmetics and fragrances. "We're fighting this on a number of fronts," says Gerald N. McEwen, vice president of science at CTFA.

"As often happens, special interest groups in California already have taken this issue to extremes by trying to restrict



Aveda technicians test facial makeup formulations.

the wearing of fragrances or scented products," which might affect people claiming to have multiple chemical sensitivity, says McEwen. For example, at one point San Francisco city policy requested people "to refrain from wearing perfumes or scented products" to public meetings. However, CTFA and the local retailing community worked together and were able to change the policy.

"There now is no mention of our products anywhere in the policy," says Irene L. Malbin, CTFA's vice president for public affairs. That won't be the end of this issue, however. The issue linking multiple chemical sensitivity with fragrances has attracted the attention of other cities and counties in California, and other states could potentially join in the debate.

The industry is also concerned about potential future legislation that would regulate personal care products, including baby shampoos, relative to their levels of potentially harmful by-products. Dioxanes and nitrosamines that are suspected carcinogens and trace by-products in certain surfactant production processes are already being scrutinized in European and Asia-Pacific markets, says Rhône-Poulenc's Manier. In anticipation of by-product regulation in the U.S., he says, Rhône-Poulenc is "working to reduce by-products production in every one of our processes."

Determining the impact of new raw materials and their by-products on consumers is becoming more difficult be-

cause of conflicting pressures within the animal testing debate. Cosmetics and toiletries companies, reacting to consumer demands, are asking for ingredients that have not been tested on animals, but at the same time, FDA has not yet approved the use of in-vitro tests as an alternative to animal tests. "The situation is perplexing. If a company has a new ingredient, it still needs to verify that it is safe. The question is how," says Lonza's Kosiek. "It would be a lot easier if there was one standard."

For now, CTFA continues to oppose bans on animal testing. To date, no state has enacted a bill banning animal testing. Over the past eight years, however, CTFA has defeated more than 50 such bills in 12 states. And so far this year, the association has been fighting bills in Vermont, Massachusetts, New York, and Illinois. "Our goal, of course, is to preserve the ability to conduct product safety testing in animals when necessary for new products and formulations," says Petrina.

CTFA has been successful in defeating animal testing legislation partly because it has been committed to developing alternatives to animal testing, putting a lot of technical resources into this effort over the past 15 years, says E. Edward Kavanaugh, CTFA president. The association is supporting research programs at Johns Hopkins University and Battelle Memorial Institute, and has also joined with the Japan Cosmetics Industry Association and with

European trade organizations in a global program.

Although FDA has not yet accepted any alternatives to tests on animals, many companies predict that the agency will have to change its stance sooner or later. Anticipating this, Rhône-Poulenc is doing no more animal tests on any of its surfactants or suggested formulations, says Manier. One problem with in-vitro tests has been the lack of correlation between irritation data obtained in animal tests and data collected in tests done in a synthetic media. However, Rhône-Poulenc says it has developed an in-vitro test with which it is now getting more than 80% concordance with numbers obtained in animal tests. "And we feel very comfortable with those results."

The avoidance of animal testing is just one of many claims that cosmetics and toiletries firms are including more often on label copy in an effort to attract the more environmentally sensitive consumer. These claims are creating much confusion in the industry because there are no national guidelines that define what

these claims really mean. This issue gained more momentum last October when President Bill Clinton signed an executive order directing federal agencies to buy environmentally preferable products when possible. To carry out the executive order, EPA has drafted government purchasing guidelines to use in deciding whether a product is "environmentally preferable."

EPA's proposed "concept paper" on general environmental characteristics of products recommends the "absence of aesthetic additives (such as fragrance or dyes) that provide cosmetic advantages only." In opposition to the recommendation, in February CTFA testified at a public meeting that it "strongly believes that the presence of fragrances or dyes in products should not be a consideration in determining the environmental preferability of products." In response, the EPA panel has agreed to delete the recommendation from the second draft of the guidelines, which is due later this month.

Although CTFA was successful in

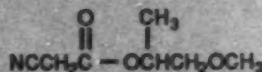
driving home this point, this issue is not completely behind the industry. The final guidelines "could literally change the future of the chemical industry" depending on what they propose, says Steve Ashkin, vice president of Rochester Midland, Rochester, N.Y.-based specialty chemicals producer that has developed an environmentally friendly product line of detergents and hand soaps.

CTFA realizes that it will be waging an uphill battle over the next few years as it carries out its mission to "provide its members with maximum flexibility in the marketplace without unreasonable government interference. [FDA Commissioner] Kessler is always searching for new crusades," says Hutt. "Our industry must be very careful not to give FDA an irresistible opportunity—an easy opening—to march in and make an example of one of our products or companies. Cosmetic companies must strengthen efforts to ensure proper labeling and manufacturing, so that cosmetics remain a low priority at FDA." □

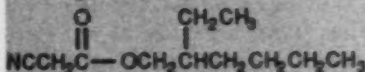
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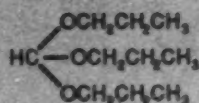
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